THE COMPARATIVE DIGESTIBILITY AND FEEDING EFFICIENCY OF PELLETED AND NONPELLETED RATIONS FOR FEEDER LAMBS

by

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INTRODUCTION

Commercial lamb feeders in Kansas and elsewhere have shown an increased interest in completely pelleted rations in recent years. Experimental tests at Kansas State College and other experimental stations have shown generally that pelleted rations produce greater gains than similar but unpelleted rations. The pounds of feed required to produce a pound of gain have also usually been less when the pelleted rations have been fed. In most of the experimental work previously reported, the experimental lambs were group fed with no duplication or replication of lots; consequently the efficiency of feed utilization in the feed lot could not be compared statistically. In order to allow statistical analysis of feed utilization in this study, lambs were individually fed the different rations. The rations were also fed to groups of lambs so that the performance of individual and group fed lambs could be compared.

Results of digestion trials and balance studies with lambs fed completely pelleted rations and similar but unpelleted rations were not available in the literature. Such tests, included in these studies should provide a clearer understanding of some of the basic problems in the utilization of pelleted and unpelleted feeds.

REVIEW OF LITERATURE

Studies of pelleted and partially pelleted rations for sheep have received an increasing amount of attention at experimental stations during the past five years. The most extensive work concerning pelleting was started at New Mexico A and M in 1950. Neale (1953) reported that in the Rio Grande Valley only the first and fifth cuttings of alfalfa were of high quality.

The second, third, and fourth cuttings of alfalfa were coarse, stemmy, and possibly rain damaged and difficult to market. In an attempt to make these cuttings more palatable and more efficiently utilized, the hay was processed with sorghum grain and molasses into cubes that could be self-fed. The unpelleted and unground rations included only good quality alfalfa hay and sorghum grain. The importance of a high percentage of roughage in the pellet is emphasized in this report and in some trials seventy percent of the pellet was made up of coarse alfalfa hay. The pellet containing the larger amount of roughage was more efficient than one containing fifty percent roughage and less digestive disturbances were noticed. In these New Mexico tests, lambs self-fed pellets gained faster and used less feed per pound of gain than lambs hand-fed unpelleted rations. When the cost of pelleting was considered the economic advantage of the pelleted rations are not so apparent. The light lambs fed the highest concentrated rations did the poorest and the heavy lambs receiving the lower concentrated pellets responded the best. This study was also complicated by the presence of the molasses in the pelleted rations.

Thomas (1953-54) found that lambs fed rations in pelleted form gained faster and more efficiently than lambs fed whole grain and long hay, but when the extra cost of pelleting was added to the total feed cost, the economic advantage was lost. Lambs fed pellets graded higher and sold for a higher price per hundred pounds, but the increased return did not compensate for the additional cost.

Jordan et al. (1953-54) used a pelleted ration containing sixty percent concentrate and forty percent roughage. The lambs developed a craving for roughage and began to chew on the feed bunks and fence posts. Because of this condition, one-third pound of long alfalfa hay was provided with the pellets, but no additional gain was obtained from this practice. As in previous reports, an increase in rate of gain and feed efficiency was reported in this trial with the pelleted feeds over the same ration hand-fed.

Test at Washington State College (Schneider et al., 1953) showed no increase in rate of gain or efficiency of gain from lambs hand or self-fed pelleted rations when compared to lambs getting unpelleted rations.

Noble (1952-53) reported that tests at Oklahoma A and M College showed a very slight increase in rate and efficiency of gain from lambs given pelleted rations compared to the gains made by lambs given similar but unpelleted rations. When the feed cost was determined, the pelleted rations were higher due to the extra cost of pelleting the ration.

Bell (1954) reported that pelleted alfalfa was first used at Kansas State College in 1948. Since then experiments have been designed to use the entire ration in pellet form. In 1953 studies were conducted with feeder lambs comparing pelleted and unpelleted alfalfa hay and corn. The lambs given the pelleted ration gained more rapidly and used their feed more efficiently than the lambs receiving the unpelleted rations. When pelleting cost of twelve dollars per ton was included in the feed bill, the feed cost of the pellet-fed lambs became higher than that of the hand-fed group. The feed with the higher roughage ratio (seventy percent hay) proved to be the most efficient and economical. This is in agreement with the New Mexico studies.

In similar studies at the Garden City branch station (Bell and Erhart, 1953-54), the entire ration consisting of fodder, milo grain, and protein was pelleted and compared to a similar but unpelleted ration. The group receiving the pelleted ration gained faster and on less feed per hundred pounds of gain, but the cost of the processing and pelleting made the cost of gains much higher for lambs on the pelleted ration. The main processing expense incorporated in making the pellet is the dehydrating of the roughage used.

Recent studies at the Illinois Agriculture Experiment Station (1955) were conducted to determine the effect of self-fed pelleted and self-fed meal rations of varied quality on the rate and economy of gain. These trials indicated that pelleted alfalfa meal and corn were of slight value, hardly enough to warrant the cost of pelleting. The pelleting of rations containing timothy meal greatly increased economy as well as rate of gain. The lots eating pelleted rations in which timothy was the roughage out gained the control lots receiving alfalfa as a roughage, indicating that lambs will make satisfactory gains on low quality roughages if properly prepared and supplemented.

EXPERIMENTAL PROCEDURE

Feeding Trial

Seventy six black faced feeder lambs were used in this study. They were raised in Colorado and were purchased at the Kansas City Stock Yards. The lambs arrived at the Kansas State College station in early October and were placed in dry lot on arrival. Prairie hay was provided for the first few days of the preliminary feeding period and then alfalfa hay was used for the remainder of the experiment. After the first week small amounts of cracked corn were provided with the hay and was steadily increased until they were getting about one pound per day.

The top sixteen lambs by weight were separated and used for metabolism studies. This group was fed the same rations used in the feeding trials. The remaining group was weighed, numbered, and lotted randomly into four lots of ten lambs each and four lots of five lambs each. They were then placed in pens having one end covered by an open shed facing south. This group of pens had six large lots, therefore, lots five and six were lotted together when turned out of the individual self-feeding stalls. Lots seven and eight were also handled in this manner. This resulted in six pens of ten lambs each.

At the beginning of the experiment, the four lots to be fed the pelleted rations were started on the pellets with the low concentration. After these lambs were accustomed to the pelleted feed, the two lots to receive the higher concentrated pellets were then changed to the new ratio. While starting the lambs on this pelleted ration, a limited amount of long alfalfa hay was provided for the first few days. The feeding period began November 2 and continued for eighty-six days.

The rations fed to the lots were as follows:

Group I
- Lot 1. Pelleted ration - (sixty-five percent dehydrated alfalfa hay and thirty-five percent corn)
- Lot 3. Unpelleted ration - (sixty-five percent chopped alfalfa hay and thirty-five percent cracked corn)
- Lot 5. Same as lot 1 - individually self-fed.
- Lot 7. Same as lot 3 - individually self-fed.

Group II
- Lot 2. Pelleted ration - (fifty-five percent dehydrated alfalfa hay and forty-five percent corn)
- Lot 4. Unpelleted ration - (fifty-five percent chopped alfalfa hay and forty-five percent cracked corn)
- Lot 6. Same as lot 2 - individually self-fed.
- Lot 8. Same as lot 4 - individually self-fed.

The total digestible nutrient values of the rations were used in calculating the amount of feed for each lot during the experiment. Each hand-fed lot received the same amount of total digestible nutrients until the latter part of the feeding period (January 3) when lot number two went off feed and had to have the amount of feed lowered. At this time lot number one was eating all the pellets they would clean up so their feed volume was not changed, but lot numbers three and four did take more feed when the quantity was increased. Lot number two never did get back on full-feed, therefore, the initial design for feed quantity was not in effect during the latter part of the experiment.

The alfalfa hay used in this test was harvested from the same area for the pelleted and nonpelleted feeds. For the pelleted rations the hay was taken from the field as it was cut and then dehydrated. The hay for the unpelleted rations was cured in the field, baled, and chopped for its use in this trial. The corn for each type ration was taken from the same bulk at the Manhattan Elevator.

The individual self-fed lambs were placed in separate feeding pens for two hours night and morning. Small self-feeders were located at one end of these pens for each lamb. When the lambs were through eating they were turned out in the regular size pens. The lambs fed as a group were hand-fed twice daily. Water and salt were available at all times during the test.

Individual weights were taken at the beginning of the experiment, every two weeks during the test, and at the close of the test. The lambs were graded individually by three college staff members and the grades were given numerical values which are better adapted to calculations. The value given each grade is as follows:

Top choice 4
Middle choice 5
Low choice 6

Top good 7
Middle good 8
Low good 9

Average daily gain, feed intake, feed consumed per hundred pounds of gain, and financial results were recorded. A sample was taken from the corn, both pelleted feeds, and alfalfa hay for chemical analysis.

Metabolism Studies

The sixteen heavy weight feeder lambs used in the metabolism trials were divided into two groups of eight lambs each. Both groups were then placed on an approximate full-feed of sixty-five percent chopped alfalfa hay and thirty-five percent cracked corn. On November 12 group A was brought into the metabolism room and placed in crates designed for this type study. After getting accustomed to the crates the lambs were started on experiment November 16 and the first collection was made the following afternoon. Collections were made at four o'clock each afternoon for seven consecutive days.

After the first collection period was completed, group A was taken back to the sheep barn and group B was brought to the metabolism room and placed in the same crates. Group B was handled in the same manner as the first group. This resulted in sixteen individual tests for this ration. After group A was taken out of the crates they were placed on their second ration to be tested. This rotation was the same throughout the eight week collection period.

Digestibility Trial. A twenty-four hour feces sample was collected each afternoon. This sample was weighed and a five percent aliquot was placed in a porcelainized pan which in turn was placed in the drying oven at sixty-five degrees centigrade. Another aliquot was added each afternoon until the seven day collection period was completed. After the final collection, the oven was turned up to ninty-five degrees centigrade until the feces were completely dry. The dry feces were weighed, placed in sealed glass jars, and taken to the chemistry laboratory for analysis.

Nitrogen Balance. The urine was also collected every twenty-four hours and an approximate five percent aliquot was placed in sealed glass jars. Toluene was added as a preservative. The jars were kept in a cool place until

EXPLANATION OF PLATE I

Fig. 1. Picture of the individual feeding pens and self-feeding boxes used in the feeding trials.

Fig. 2. Picture of a metabolism crate designed for the collection of feces and urine which was used for the metabolism studies.

PLATE I

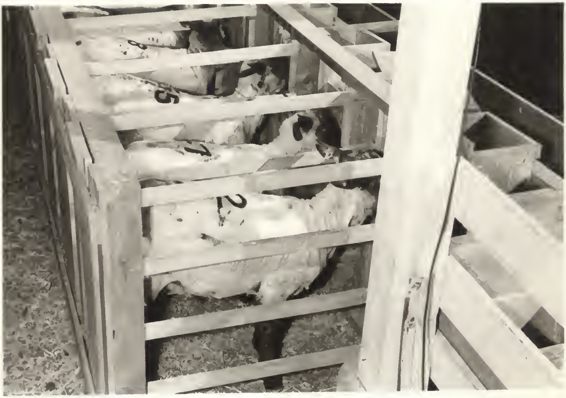

Fig. 1.

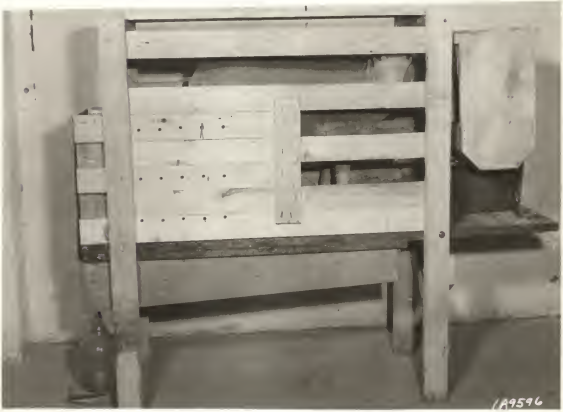

Fig. 2.

the seven composite samples were collected. Then the urine was taken to the chemistry laboratory for a nitrogen analysis.

RESULTS AND DISCUSSION

Feeding Trial

With one exception, the lambs given pelleted rations of similar concentration and similar feeding management made faster and more efficient gains than lambs given the unpelleted rations. This exception was in lot number two which went off feed several times, resulting in gains that were statistically lower and less efficient than the gains of group-fed lambs on a similar but unpelleted ration.

Pelleted rations made up of sixty-five percent alfalfa hay and thirty-five percent corn gave significantly better results when either fed individually or in groups, than did pelleted rations containing fifty-five percent alfalfa hay and forty-five percent corn. However, unpelleted rations containing fifty-five percent alfalfa hay and forty-five percent corn produced faster and more efficient gains than the unpelleted rations containing the higher percentage of roughage. These differences, however, were not statistically significant.

Despite the greater efficiency of gain obtained by feeding the pelleted ration, the cost of gain was considerably higher when the pellets were fed because of the high cost of pelleting. Financial results, feed intake, feed consumed per hundred pounds of gain, and daily gain are shown in Table 1.

There was only one third of an average grade difference between the highest and lowest grading lots as shown in Table 1.

Table 1. Feeding trials with lambs on pelleted and unpelleted rations of varying concentrations.

Lot number	1	2	3	4	5	6	7	8
Ration	pelleted 65% hay 35% corn	pelleted 55% hay 45% corn	unpelleted 65% hay 35% corn	unpelleted 55% hay 45% corn	same as lot 1 self-fed	same as lot 2 self-fed	same as lot 3 self-fed	same as lot 4 self-fed
No. lambs per lot	9	9	9	8	5	5	4	5
Days on feed	86	86	86	86	86	86	86	86
Initial wt. per lamb	81.6	81.8	83.9	83.4	83.0	83.0	82.5	81.6
Final wt. per lamb	111.5	101.4	108.2	109.6	111.8	107.0	96.0	101.6
Total gain per lamb	30.3	19.6	24.3	26.2	28.8	24.0	13.5	20.0
Daily gain per lamb	.352	.228	.283	.306	.335	.279	.159	.233
Feed per lamb daily								
pellet	2.92	2.51			2.76	2.51		
cracked corn			1.05	1.32			.88	1.24
chopped hay			1.97	1.61			1.63	1.51
Feed per cwt.								
pellet	829	1100			824	901		
cracked corn			374	433			560	532
chopped hay			696	530			1040	650
Feed cost per cwt.	$19.14	$26.41	$17.98	$17.71	$19.02	$21.63	$26.89	$21.75
Feed cost per lamb	$5.80	$5.18	$4.30	$4.64	$5.48	$5.19	$3.63	$4.35
Live market grade *	5.11	6.20	5.75	6.05	5.06	5.20	5.02	5.60
No. lambs died **				1			1	
No. lambs removed #	1	1	1	1				

* Grades were based on numerical values. (lower values indicate better lambs)

** One lamb was lost from enterotoxemia and the other from an undetermined cause.

# Removed because of abnormal results which may or may not have been a result of this test.

Table 2. Chemical analysis of feeds used in this experiment.

Feeds	Moisture	Protein	Ether extract	Fiber	N-free extract	Mineral matter	Carbohydrates
			Per cent				
Pellets *	7.35	15.00	3.84	14.86	51.01	7.94	65.87
Pellets **	7.75	15.19	4.07	12.15	53.64	7.20	65.79
Corn #	10.19	10.75	4.00	2.15	71.22	1.69	73.37
Alfalfa hay ##	5.40	13.06	1.78	33.88	37.66	8.22	71.54

* Pellets consisting of sixty-five per cent dehydrated alfalfa hay and thirty-five per cent corn.

** Pellets consisting of fifty-five per cent dehydrated alfalfa hay and forty-five per cent corn.

# The corn used in the pelleted and unpelleted rations were taken from the same bulk at the Manhattan Elevator.

## The alfalfa hay in the pelleted rations and unpelleted rations were harvested from the same area.

Two lambs were lost during the experiment, one from enterotoxemia and the other from an underternined cause. These lambs were replaced by extra lambs on hand, but were not included in the final calculations. Four lambs were removed from the test because of sickness or abnormal performance, which may or may not have been a result of the experimental treatment.

Metabolism Studies

Digestion Study. The lambs fed the pelleted rations had significantly higher protein and ether extract digestion coefficients than lambs fed the unpelleted rations, but had much lower fiber digestion coefficients. This decreased fiber digestion might possibly be due to (1) a physical or chemical change brought about by the dehydration process in the pelleted rations, (2) the finely ground food particles passed through the rumen before the bacteria had time to properly digest the fiber, (3) the absense of rumenation and rumen movement causing an upset in the kind and number of microflora, or (4) making other nutrients more available for the bacteria to utilize for their food source.

There were no noticable differences in the total digestible nutrient value of the pelleted and unpelleted rations, but in the fifty-five forty-five rations the total digestible nutrient values were significantly higher. This value was equalized by the differences in protein and fiber digestion in the pelleted rations counterbalanced by the opposite effect in the unpelleted rations.

Nitrogen Balance. The average percent nitrogen retained per lamb was much greater in the two pelleted rations than in the unpelleted rations. This is in agreement with the increase in rate of gain by the pelleted lots in the feeding trial. A fifteen percent increase in nitrogen retention was

Table 3. Digestion and nitrogen balance studies with lambs using varying ratios of roughage to concentrate with pelleted and non-pelleted rations.

Lot number	A	B	C	D
No. lambs	16	16	15*	16
Ration	65% alfalfa hay 35% corn	55% alfalfa 45% corn	65% alfalfa 35% corn	55% alfalfa 45% corn
Preparation	chopped hay cracked corn	chopped hay cracked corn	pelleted	pelleted
Dig. coeff. **				
protein	62.03	65.84	66.37	71.76
ether extract	50.53	63.65	62.07	77.06
fiber	52.18	50.52	25.77	27.47
N.F.E.	80.35	83.32	83.06	86.25
% T.D.N. **	62.12	65.75	61.52	67.54
% Nitrogen *** retained/lamb	0.19	2.20	15.56	26.26

* Failure to eat caused the removal of one lamb in this lot.

** Individual results are shown in appendix table 1.

*** Individual results are shown in appendix table 2.

obtained from the high roughage pellet and a twenty-five percent increase from the lower roughage pellet over the same rations fed as chopped alfalfa hay and cracked corn. These differences were very highly significant. A negative nitrogen balance from some of the lambs in the unpelleted groups gave indications of a depletion of protein reserve in the body.

The digestion coefficients, percent nitrogen retained, and the percent total digestible nutrients are shown in Table 3.

SUMMARY

Sixty black faced feeder lambs were used in this feeding study. They were randomly separated and placed into eight lots, four lots having ten lambs each and four lots with five lambs each. Two rations were fed, with each ration comparing pelleted and unpelleted preparations. The first ration, sixty-five percent alfalfa hay and thirty-five percent corn, was used in four lots with the following differences: (1) the ration for lot one was pelleted and hand-fed twice daily, (2) lot three had chopped alfalfa hay and cracked corn hand-fed twice daily, (3) lot five was the same as lot one, individually self-fed, and (4) lot seven was the same as lot three, individually self-fed. The second ration, fifty-five percent alfalfa hay and forty-five percent corn, was handled in the same manner as the first ration only on lot numbers two, four, six, and eight respectively. Sixteen lambs from the same group were used for metabolism studies and the feces and urine were collected for digestion and nitrogen balance studies.

There was a significant difference in weight gain and feed efficiency in favor of the pelleted rations with the sixty-five percent dehydrated alfalfa hay and thirty-five percent corn proving the most satisfactory in the pelleted feeds. However, in the unpelleted rations, the fifty-five percent hay and forty-five percent corn was more efficient than the higher roughage ration but was not statistically significant.

The results in the digestion studies were very uniform and the greatest difference between the pelleted and unpelleted feeds was the lower percent of fiber digested by lambs fed the pelleted rations. The fiber digestion coefficients in the pelleted rations were only half as high as they were in the unpelleted rations. This was offset by the higher protein and ether extract digestion coefficients of the pelleted feeds; therefore, there was no noticeable difference in the total digestible nutrients of the pelleted and unpelleted rations.

The lambs fed the pelleted rations retained a much higher average percent of nitrogen than the lambs on similar but unpelleted feeds. This could be expected as the feeding trial showed an increase in rate of gain from the lambs fed the pelleted rations. Also there was a higher percent of protein digested in the pelleted feeds which would give more nitrogen available for retention.

ACKNOWLEDGMENT

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APPENDIX

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Table 1. Digestion study with lambs.

Lamb	Lot	Ration	Total grams fed	% protein	Grams crude protein	% ether ex.	Grams ether ex.	x 2.25	% crude fiber	Grams crude fiber	% N.F.E.	Grams N.F.E.	Total dig.	% T.D.N.
1	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	3049.01	14.81	451.56	4.02	122.57		34.27	1044.90	31.78	968.98		
		Amt. digested			661.66		109.71	246.85		1025.06		3519.34	5452.91	60.01
		Dig. coefficient			59.44		47.23			49.52		78.41		
2	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2965.49	14.69	435.63	3.76	111.50		33.32	988.10	32.77	971.79		
		Amt. digested			677.59		120.78	271.76		1081.86		3516.53	5547.74	61.06
		Dig. coefficient			60.87		52.00			52.26		78.35		
3	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2958.22	14.75	436.34	4.06	120.10		32.49	961.13	33.36	986.86		
		Amt. digested			676.88		112.18	252.41		1108.83		3501.46	5539.58	60.97
		Dig. coefficient			60.80		48.30			53.57		78.01		
4	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2610.42	14.69	383.47	4.67	121.91		33.21	866.92	31.38	819.15		
		Amt. digested			729.75		110.37	248.33		1203.04		3669.17	5850.29	64.39
		Dig. coefficient			65.55		47.52			58.12		81.75		
5	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2760.52	15.94	440.03	4.58	126.43		32.52	897.72	30.80	850.24		
		Amt. digested			673.19		105.85	238.16		1172.24		3638.08	5721.67	62.97
		Dig. coefficient			60.47		45.57			56.63		81.06		
6	A	Alf. hay	4220	13.06	551.13	1.78	75.12		33.88	1429.74	37.66	1589.25		
		Corn	2270	10.75	244.03	4.00	90.80		2.15	48.81	71.22	1616.69		
		Total	6490		795.16		165.92			1478.55		3205.94		
		Feces	1695.74	14.81	251.14	4.00	67.83		33.45	567.23	31.13	527.88		
		Amt. digested			544.02		98.09	220.70		911.32		2678.06	4354.10	67.09
		Dig. coefficient			68.42		59.12			61.64		83.53		
7	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2908.45	15.13	440.05	4.43	128.84		33.39	971.13	31.45	914.71		
		Amt. digested			673.17		103.44	232.74		1098.83		3573.61	5578.35	61.39
		Dig. coefficient			60.47		44.53			53.08		79.62		
8	A	Alf. hay	5908	13.06	771.58	1.78	105.16		33.88	2001.63	37.66	2224.95		
		Corn	3178	10.75	341.64	4.00	127.12		2.15	68.33	71.22	2263.37		
		Total	9086		1113.22		232.28			2069.96		4488.32		
		Feces	2988.45	14.69	439.00	4.42	132.09		33.37	997.25	32.06	958.10		
		Amt. digested			674.22		100.19	225.43		1072.71		3530.22	5502.58	60.56
		Dig. coefficient			60.56		43.13			51.82		78.65		
9	A	Alf. hay	3291	13.06	429.80	1.78	58.58		33.88	1114.99	37.66	1239.39		
		Corn	1860	10.75	199.95	4.00	74.40		2.15	39.99	71.22	1324.69		
		Total	5151		629.75		132.98			1154.98		2564.08		
		Feces	1612.93	14.44	232.91	3.70	59.68		36.85	594.36	28.00	451.62		
		Amt. digested			396.84		73.30	164.93		560.62		2112.46	3234.85	62.80
		Dig. coefficient			63.02		55.12			48.54		82.39		
10	A	Alf. hay	4202	13.06	548.78	1.78	74.80		33.88	1423.64	37.66	1582.47		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6516		797.54		167.36			1473.39		3230.50		
		Feces	2068.17	13.00	268.86	3.73	77.14		37.23	769.98	29.56	611.35		
		Amt. digested			528.68		90.22	203.00		703.41		2619.15	4054.24	62.22
		Dig. coefficient			66.29		53.91			47.74		81.08		
11	A	Alf. hay	3458	13.06	451.61	1.78	61.55		33.88	1171.57	37.66	1302.28		
		Corn	1862	10.75	200.17	4.00	74.48		2.15	40.03	71.22	1326.12		
		Total	5320		651.78		136.03			1211.60		2628.40		
		Feces	1658.76	14.88	246.82	3.70	61.37		35.65	591.35	28.98	480.71		
		Amt. digested			404.96		74.66	167.99		620.25		2147.69	3340.89	62.80
		Dig. coefficient			62.13		54.88			51.19		81.71		
12	A	Alf. hay	4084	13.06	533.37	1.78	72.70		33.88	1383.66	37.66	1538.03		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6398		782.13		165.26			1433.41		3186.06		
		Feces	2035.93	14.44	293.99	3.83	77.98		35.78	728.46	28.81	586.55		
		Amt. digested			488.14		87.28	196.38		704.95		2599.51	3988.98	62.35
		Dig. coefficient			62.41		52.81			49.18		81.59		
13	A	Alf. hay	4202	13.06	548.78	1.78	74.80		33.88	1423.64	37.66	1582.47		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6516		797.54		167.36			1473.39		3230.50		
		Feces	2085.71	14.81	308.89	3.83	79.88		35.45	739.38	28.02	584.42		
		Amt. digested			488.65		87.48	196.83		734.01		2646.08	4065.57	62.39
		Dig. coefficient			61.27		52.27			49.82		81.91		
14	A	Alf. hay	4202	13.06	548.78	1.78	74.80		33.88	1423.64	37.66	1582.47		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6516		797.54		167.36			1473.39		3230.50		
		Feces	2204.87	15.06	332.05	3.51	77.39		34.70	765.09	30.60	674.69		
		Amt. digested			465.49		89.97	202.43		708.30		2555.81	3932.03	60.34
		Dig. coefficient			58.37		53.76			48.07		79.11		
15	A	Alf. hay	4202	13.06	548.78	1.78	74.80		33.88	1423.64	37.66	1582.47		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6516		797.54		167.36			1473.39		3230.50		
		Feces	2095.26	14.25	298.57	3.66	76.69		35.63	746.54	29.97	627.95		
		Amt. digested			498.97		90.67	204.01		726.85		2602.55	4032.38	61.88
		Dig. coefficient			62.56		54.18			49.33		80.56		
16	A	Alf. hay	4202	13.06	548.78	1.78	74.80		33.88	1423.64	37.66	1582.47		
		Corn	2314	10.75	248.76	4.00	92.56		2.15	49.75	71.22	1648.03		
		Total	6516		797.54		167.36			1473.39		3230.50		
		Feces	2067.80	14.50	299.83	3.57	73.82		36.06	745.65	29.43	608.55		
		Amt. digested			497.71		93.54	210.47		727.74		2621.95	4057.87	62.28
		Dig. coefficient			62.41		55.89			49.39		81.16		
Total fed			119,541		14,639.06		3062.95			27,135.21		59,155.22		
Total digested					9,079.92		1547.73	3482.39		14,160.02		47,531.67	74,254	62.12
Dig. coefficient					62.03		50.53			52.18		80.35		

Table 1. (cont.)

Lamb	Lot	Ration	Total grams fed	% protein	Grams crude protein	% ether ex.	Grams ether ex.	x 2.25	% crude fiber	Grams crude fiber	% N.F.E.	Grams N.F.E.	Total dig.	% T.D.N.
1	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	2254.70	13.94	314.31	3.70	83.42		37.10	836.49	31.90	719.25		
		Amt. digested			482.95		100.83	226.87		464.24		2779.12	3953.18	59.61
		Dig. coefficient			60.58		54.72			35.69		79.44		
2	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	1892.69	15.44	292.23	3.51	66.43		34.12	645.79	32.53	615.69		
		Amt. digested			505.03		117.82	265.10		654.94		2882.68	4307.75	64.95
		Dig. coefficient			63.35		63.95			50.35		82.40		
3	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	1940.61	15.44	299.63	3.34	64.82		34.24	664.46	32.86	637.68		
		Amt. digested			497.63		119.43	268.72		636.27		2860.69	4263.31	64.28
		Dig. coefficient			62.42		64.82			48.92		81.77		
4	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	2084.83	16.38	341.50	3.95	82.35		32.03	667.77	33.60	700.50		
		Amt. digested			455.76		101.90	229.28		632.96		2797.87	4115.87	62.06
		Dig. coefficient			57.17		55.31			48.66		79.98		
5	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	1828.20	13.69	250.28	3.60	65.82		36.99	676.25	30.91	565.10		
		Amt. digested			546.98		118.43	266.47		624.48		2933.27	4371.20	65.91
		Dig. coefficient			68.61		64.28			48.01		83.85		
6	B	Alf. hay	2302	13.06	300.64	1.78	40.98		33.88	779.92	37.66	866.93		
		Corn	1862	10.75	200.17	4.00	74.48		2.15	40.03	71.22	1326.12		
		Total	4164		500.81		115.46			819.95		2193.05		
		Feces	1021.32	14.06	143.60	3.70	37.79		34.79	355.32	31.05	317.12		
		Amt. digested			357.21		77.67	174.76		464.63		1875.93	2872.53	68.98
		Dig. coefficient			71.33		67.27			56.67		85.54		
7	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	1886.44	15.19	286.55	3.51	66.21		34.41	649.12	32.57	614.41		
		Amt. digested			510.71		118.04	265.59		651.61		2883.96	4311.87	65.02
		Dig. coefficient			64.06		64.07			50.10		82.44		
8	B	Alf. hay	3650	13.06	476.69	1.78	64.97		33.88	1236.62	37.66	1374.59		
		Corn	2982	10.75	320.57	4.00	119.28		2.15	64.11	71.22	2123.78		
		Total	6632		797.26		184.25			1300.73		3498.37		
		Feces	1869.36	15.38	287.51	3.02	56.45		33.15	619.69	34.02	635.96		
		Amt. digested			509.75		127.80	287.55		681.04		2862.41	4340.75	65.45
		Dig. coefficient			63.94		69.36			52.36		81.82		
9	B	Alf. hay	3500	13.06	457.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1522.65	15.31	233.12	4.16	63.34		34.10	519.22	29.79	453.60		
		Amt. digested			531.00		113.20	254.70		727.98		2898.54	4412.22	69.42
		Dig. coefficient			69.49		64.12			58.37		86.47		
10	B	Alf. hay	3500	13.06	457.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1702.62	13.13	223.55	3.91	66.57		37.80	643.59	29.30	498.87		
		Amt. digested			540.57		109.97	247.43		603.61		2853.27	4244.88	66.79
		Dig. coefficient			70.74		62.29			48.40		85.12		
11	B	Alf. hay	2632	13.06	343.74	1.78	46.85		33.88	891.72	37.66	991.21		
		Corn	2086	10.75	224.25	4.00	83.44		2.15	44.85	71.22	1485.65		
		Total	4718		567.99		130.29			936.57		2476.86		
		Feces	1368.68	13.69	187.37	3.13	42.84		37.87	518.32	31.22	427.30		
		Amt. digested			380.62		87.45	196.76		418.25		2049.56	3045.19	64.54
		Dig. coefficient			67.01		67.12			44.66		82.75		
12	B	Alf. hay	3500	13.06	457.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1675.02	14.19	237.69	3.47	58.12		34.69	581.06	32.84	550.08		
		Amt. digested			526.43		118.42	266.45		666.14		2802.06	4261.08	67.04
		Dig. coefficient			68.89		67.08			53.41		83.59		
13	B	Alf. hay	3500	13.06	475.10	1.78	62.30		33.98	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1633.73	15.13	247.18	4.24	69.27		34.19	558.57	30.61	500.08		
		Amt. digested			561.94		107.27	241.36		688.63		2852.06	4298.99	67.64
		Dig. coefficient			67.65		60.76			53.61		85.08		
14	B	Alf. hay	3500	13.06	475.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1673.11	14.44	241.60	3.94	65.92		34.97	585.09	30.46	509.63		
		Amt. digested			522.52		110.62	248.90		662.11		2842.51	4276.04	67.28
		Dig. coefficient			68.38		62.66			53.09		84.80		
15	B	Alf. hay	3500	13.06	475.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1587.26	15.13	240.15	3.50	55.55		34.41	546.18	30.66	486.65		
		Amt. digested			523.97		120.99	272.23		701.02		2865.49	4362.71	68.64
		Dig. coefficient			68.57		68.53			56.21		85.48		
16	B	Alf. hay	3500	13.06	475.10	1.78	62.30		33.88	1185.80	37.66	1318.10		
		Corn	2856	10.75	307.02	4.00	114.24		2.15	61.40	71.22	2034.04		
		Total	6356		764.12		176.54			1247.20		3352.14		
		Feces	1773.10	15.38	272.70	3.52	62.41		34.83	617.57	30.88	547.53		
		Amt. digested			491.42		114.13	256.79		629.63		2804.61	4182.45	65.80
		Dig. coefficient			64.31		64.65			50.48		83.67		
Total fed			99,798		11,998.46		2771.28			19,592.03		52,623.48		
Total digested					7,899.49		1763.97	3968.93		9,907.54		43,844.03	65,620	65.75
Dig. coefficient					65.84		63.65			50.52		83.32		

Table 1. (cont.)

Lamb	Lot	Ration	Total grams fed	% protein	Grams crude protein	% ether ex.	Grams ether ex.	x 2.25	% crude fiber	Grams crude fiber	% N.F.E.	Grams N.F.E.	Total dig.	% T.D.N.
1	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2458.31	16.69	410.29	4.12	101.28		32.81	806.57	27.74	681.94		
		Amt. digested			706.91		184.72	415.62		300.20		3117.28	4540.01	60.96
		Dig. coefficient			63.28		64.59			27.12		82.05		
2	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2353.60	16.19	381.05	4.43	104.26		35.47	834.82	24.90	586.05		
		Amt. digested			736.15		181.74	408.92		271.95		3213.17	4630.19	62.17
		Dig. coefficient			65.89		63.55			24.57		84.57		
3	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2490.40	16.06	399.96	4.44	110.57		33.96	845.74	29.14	725.70		
		Amt. digested			717.24		175.43	394.72		261.03		3073.52	4446.51	59.70
		Dig. coefficient			64.20		61.34			23.58		80.90		
4	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2397.73	17.56	421.04	4.26	102.14		35.47	850.47	29.31	702.77		
		Amt. digested			696.16		183.86	413.69		256.30		3096.45	4462.60	59.92
		Dig. coefficient			62.31		64.29			23.16		81.50		
5	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2328.67	15.19	353.72	4.99	116.20		38.22	890.02	27.14	632.00		
		Amt. digested			763.48		169.80	382.05		216.75		3167.22	4529.50	60.81
		Dig. coefficient			68.34		59.37			19.58		83.37		
6 *	C	Pellet												
		Feces												
		Amt. digested												
		Dig. coefficient												
7	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2383.43	16.13	384.45	4.81	114.64		36.97	881.15	27.02	644.00		
		Amt. digested			732.75		171.36	385.56		225.62		3155.22	4499.15	60.41
		Dig. coefficient			65.59		59.92			20.39		83.05		
8	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2155.51	16.38	353.07	5.22	112.52		34.70	747.96	28.47	613.67		
		Amt. digested			764.13		173.48	390.33		358.81		3185.55	4698.82	63.09
		Dig. coefficient			68.40		60.66			32.42		83.85		
9	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2238.75	16.94	379.24	4.73	105.89		33.18	742.82	27.95	625.73		
		Amt. digested			737.96		180.11	405.25		363.95		3173.49	4680.65	62.84
		Dig. coefficient			66.05		62.98			32.88		83.53		
10	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2231.44	15.19	338.96	4.48	99.97		37.78	843.04	28.49	635.74		
		Amt. digested			778.24		186.03	418.57		263.73		3163.48	4624.02	62.08
		Dig. coefficient			69.66		65.05			23.83		83.27		
11	C	Pellet	5026	15.00	753.90	3.84	193.00		14.86	746.86	51.01	2563.76		
		Feces	1581.90	15.75	249.15	4.40	69.60		37.08	586.57	29.11	460.49		
		Amt. digested			504.75		123.40	277.65		160.29		2103.27	3045.96	60.60
		Dig. coefficient			66.95		63.94			21.46		82.04		
12	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2241.73	15.75	353.07	4.25	95.27		36.87	826.53	28.85	644.50		
		Amt. digested			764.13		190.73	429.14		280.24		3154.72	4628.23	62.14
		Dig. coefficient			68.40		66.69			25.32		83.04		
13	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2180.47	15.88	346.26	5.10	111.20		36.61	798.27	26.59	579.79		
		Amt. digested			770.94		174.80	393.30		308.50		3219.43	4692.17	63.00
		Dig. coefficient			69.01		61.12			27.87		84.74		
14	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2223.38	16.94	376.64	5.04	112.06		34.49	766.84	27.98	622.10		
		Amt. digested			740.56		173.94	391.37		339.93		3177.12	4648.98	62.42
		Dig. coefficient			66.29		60.82			30.71		83.63		
15	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2371.75	16.44	389.92	5.14	121.91		35.70	846.71	28.32	671.68		
		Amt. digested			727.28		164.09	369.20		260.06		3127.54	4484.08	60.21
		Dig. coefficient			65.10		57.37			23.50		82.32		
16	C	Pellet	7448	15.00	1117.20	3.84	286.00		14.86	1106.77	51.01	3799.22		
		Feces	2249.62	16.75	376.81	5.08	114.28		35.09	789.39	27.53	619.32		
		Amt. digested			740.39		171.72	386.37		317.38		3179.90	4624.04	62.08
		Dig. coefficient			66.27		60.04			28.68		83.70		
Total fed			109,298		16,394.70		4197.00			16,241.64		55,752.84		
Total digested					10,881.07		2605.21	5861.72		4,184.74		46,307.36	67,234.9	61.52
Dig. coefficient					66.37		62.07			25.77		83.06		

* Failure to eat caused the removal of this lamb.

Table 1. (cont.)

Lamb	Lot	Ration	Total grams fed	% protein	Grams crude protein	% ether ex.	Grams ether ex.	x 2.25	% crude fiber	Grams crude fiber	% N.F.E.	Grams N.F.E.	Total dig.	% T.D.N.
1	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	2092.53	14.00	292.95	3.39	70.94		31.44	657.89	27.38	572.93		
		Amt. digested			755.46		209.97	472.43		180.70		3129.30	4537.89	65.75
		Dig. coefficient			72.06		74.75			21.55		84.52		
2	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1824.40	17.31	315.80	3.70	67.50		35.33	644.56	29.81	543.85		
		Amt. digested			732.61		213.41	480.17		194.03		3158.38	4565.19	66.14
		Dig. coefficient			69.88		75.97			23.14		85.31		
3	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1846.62	16.81	310.42	3.70	68.32		33.99	627.67	29.61	546.78		
		Amt. digested			737.99		212.59	478.33		210.92		3155.45	4582.69	66.40
		Dig. coefficient			70.39		75.68			25.15		85.23		
4	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1787.01	17.44	311.65	3.91	69.87		34.80	621.88	29.37	524.84		
		Amt. digested			736.76		211.04	474.84		216.71		3177.39	4605.70	66.73
		Dig. coefficient			70.27		75.13			25.84		85.82		
5	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1764.45	15.75	277.90	3.67	64.76		37.64	664.14	28.88	509.57		
		Amt. digested			770.51		216.15	486.34		174.45		3192.66	4623.96	67.00
		Dig. coefficient			73.49		76.95			20.80		86.24		
6	D	Pellet	4416	15.19	670.79	4.07	179.73		12.15	536.54	53.64	2368.74		
		Feces	1097.59	15.81	173.53	3.90	42.81		37.28	409.18	28.79	316.00		
		Amt. digested			497.26		136.92	308.07		127.36		2052.74	2985.43	67.60
		Dig. coefficient			74.13		76.18			23.74		86.66		
7	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1675.95	16.50	276.53	4.02	67.37		35.70	598.31	28.71	481.17		
		Amt. digested			771.88		213.54	480.47		240.28		3221.06	4713.69	68.29
		Dig. coefficient			73.62		76.02			28.65		87.00		
8	D	Pellet	6902	15.19	1048.41	4.07	280.91		12.15	838.59	53.64	3702.23		
		Feces	1746.39	16.75	292.52	3.08	53.79		36.52	637.78	29.29	511.52		
		Amt. digested			755.89		227.12	511.02		200.81		3190.71	4658.43	67.49
		Dig. coefficient			72.10		80.85			23.95		86.18		
9	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	2005.40	18.13	363.58	3.55	71.19		33.75	676.82	29.21	585.78		
		Amt. digested			795.42		239.35	538.54		250.23		3506.95	5091.14	66.73
		Dig. coefficient			68.63		77.08			26.99		85.69		
10	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	1818.47	16.75	304.59	3.81	69.28		34.83	633.37	30.22	551.36		
		Amt. digested			854.41		241.26	542.84		293.68		3541.37	5232.30	68.58
		Dig. coefficient			73.72		77.69			31.68		86.53		
11	D	Pellet	4271	15.19	648.76	4.07	173.83		12.15	518.93	53.64	2290.96		
		Feces	760.90	16.56	126.01	3.56	27.09		36.14	274.99	29.35	223.32		
		Amt. digested			522.75		146.74	330.17		243.94		2067.64	3164.50	74.09
		Dig. coefficient			80.58		84.42			47.01		90.25		
12	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	2002.72	16.88	338.06	3.64	72.90		35.05	701.95	30.23	605.42		
		Amt. digested			820.94		237.64	534.69		225.10		3487.31	5068.04	66.42
		Dig. coefficient			70.83		76.52			24.28		85.21		
13	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	1804.26	18.31	330.36	3.15	56.83		34.31	619.04	29.50	532.26		
		Amt. digested			828.64		253.71	570.85		308.01		3560.47	5267.97	69.04
		Dig. coefficient			71.50		81.70			33.22		86.99		
14	D	Pellet	7560	15.19	1148.36	4.07	264.60		12.15	918.54	53.64	4055.18		
		Feces	1853.98	18.63	330.36	3.50	63.15		34.85	628.78	29.21	527.02		
		Amt. digested			818.00		201.45	453.26		289.76		3528.16	5089.18	67.32
		Dig. coefficient			71.23		76.13			31.55		87.00		
15	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	1946.69	17.69	344.37	3.59	69.87		34.47	671.02	29.72	578.56		
		Amt. digested			814.63		240.67	541.51		256.03		3514.17	5126.34	67.19
		Dig. coefficient			70.29		77.50			27.62		85.86		
16	D	Pellet	7630	15.19	1159.00	4.07	310.54		12.15	927.05	53.64	4092.73		
		Feces	1859.13	18.56	345.05	3.27	60.79		35.30	656.27	28.48	529.48		
		Amt. digested			813.95		249.75	561.94		270.78		3563.25	5209.92	68.28
		Dig. coefficient			70.23		80.42			29.21		87.06		
Total fed			110,341		16,760.78		4447.77			13,406.44		59,186.87		
Total digested					12,027.10		3451.31	7765.45		3,682.79		51,047.01	74,522.4	67.54
Dig. coefficient					71.76		77.60			27.47		86.25		

Table 2. Nitrogen balance study with lambs.

Lamb	Lot	Grams N consumed	Grams dry feces	Grams N in feces	% N in feces	Total ml. urine	Grams N per ml. urine	Grams N in urine	% N in urine	Total N in feces and urine	% N in feces and urine	% N retained by lamb
1	A	178.12	5256	72.25	40.56	4705	.01977	93.02	52.22	165.27	92.79	7.21
2	A	178.12	6191	69.70	39.13	12840	.00700	89.88	50.46	159.58	89.59	10.41
3	A	178.12	5417	69.81	39.19	10085	.00965	97.32	54.64	167.13	93.83	6.17
4	A	178.12	4209	61.36	34.45	5900	.01900	112.10	62.94	173.46	97.38	2.62
5	A	178.12	4521	70.40	39.52	3690	.02756	101.70	57.10	172.10	96.62	3.38
6	A	127.23	3312	40.18	31.58	5300	.01413	74.89	58.86	115.07	90.44	9.56
7	A	178.12	6058	70.41	39.53	21875	.00511	111.78	62.76	182.19	102.28	-2.28
8	A	178.12	5527	70.24	39.43	13490	.00699	94.30	52.94	164.54	92.38	7.62
9	A	100.76	2238	37.27	36.99	4895	.01677	82.09	81.47	119.36	118.46	-18.46
10	A	127.61	3386	43.02	33.71	10410	.00941	97.96	76.77	140.98	110.48	-10.48
11	A	104.28	2429	39.49	37.87	3390	.02577	87.36	83.77	126.85	121.64	-21.64
12	A	125.14	3613	47.04	37.59	5805	.01434	83.24	66.52	130.28	104.11	-4.11
13	A	127.61	4211	49.42	38.73	4700	.01805	84.84	66.48	134.26	105.21	-5.21
14	A	127.61	6054	53.13	41.63	3640	.02161	78.66	61.64	131.79	103.28	-3.28
15	A	127.61	3380	47.77	37.43	3835	.02095	80.34	62.96	128.11	100.39	-.39
16	A	127.61	3975	47.97	37.59	4265	.01849	78.86	61.80	126.83	99.39	.61
Total		2342.30		889.46				1448.34		2337.80		
Average					37.97				61.83		99.81	.19

Table 2. (cont.).

Lamb	Lot	Grams N consumed	Grams dry feces	Grams N in feces	% N in feces	Total ml. urine	Grams N per ml. urine	Grams N in urine	% N in urine	Total N in feces and urine	% N in feces and urine	% N retained by lamb
1	B	127.56	4390	50.29	39.42	2197	.02694	59.19	46.40	109.48	85.83	14.17
2	B	127.56	3865	46.76	36.66	7480	.00927	69.34	54.36	116.10	91.02	8.98
3	B	127.56	3101	47.94	37.58	7905	.01003	79.29	62.16	127.23	99.74	.26
4	B	127.56	4288	54.64	42.83	7210	.01047	75.49	59.18	130.13	102.01	-2.01
5	B	127.56	2913	40.04	31.39	4265	.02073	88.41	69.31	128.45	100.70	-.70
6	B	80.13	1642	22.98	28.68	5960	.00879	52.39	65.38	75.37	94.06	5.94
7	B	127.56	3532	45.85	35.94	23781	.00431	102.50	80.35	148.35	116.30	-16.30
8	B	127.56	3301	46.00	36.06	12935	.00669	86.54	67.84	132.54	103.90	-3.90
9	B	122.26	2694	37.30	30.51	4430	.01740	77.08	63.05	114.38	93.55	6.45
10	B	122.26	2729	35.77	29.26	7935	.00917	72.76	59.51	108.53	88.77	11.23
11	B	90.88	2065	29.98	32.99	3000	.02385	71.55	78.73	101.53	111.72	-11.72
12	B	122.26	2882	38.03	31.11	6880	.01136	78.16	63.93	116.19	95.04	4.96
13	B	122.26	3524	39.55	32.35	3700	.02125	78.63	64.31	118.18	96.66	3.34
14	B	122.26	3848	38.66	31.62	5005	.01407	70.42	57.60	109.08	89.22	10.78
15	B	122.26	2914	38.42	31.42	4635	.01721	79.77	65.25	118.19	96.67	3.33
16	B	122.26	3065	43.63	35.69	5970	.01342	80.12	65.53	123.75	101.22	-1.22
Total		1919.75		655.84				1221.64		1877.48		
Average					34.16				63.64		97.80	2.20

Table 2. (cont.).

Lamb	Lot	Grams N consumed	Grams dry feces	Grams N in feces	% N in feces	Total ml. urine	Grams N per ml. urine	Grams N in urine	% N in urine	Total N in feces and urine	% N in feces and urine	% N retained by lamb
1	C	178.75	4577	65.65	36.73	3035	.02625	79.67	44.57	145.32	81.30	18.70
2	C	178.75	3949	60.97	34.11	11840	.00721	85.37	47.76	146.34	81.87	18.13
3	C	178.75	4363	63.99	35.80	14815	.00560	82.96	46.41	146.95	82.21	17.79
4	C	178.75	4536	67.37	37.69	9090	.00886	80.54	45.06	147.91	82.75	17.25
5	C	178.75	3662	56.60	31.66	4375	.02238	97.91	54.77	154.51	86.44	13.56
*												
7	C	178.75	4310	61.51	34.41	22465	.00474	106.48	59.57	167.99	93.98	6.02
8	C	178.75	3912	56.49	31.60	13405	.00706	94.64	52.95	151.13	84.55	15.45
9	C	178.75	3938	60.68	33.95	9890	.00975	96.43	53.95	157.11	87.89	12.11
10	C	178.75	4041	54.23	30.34	12700	.00807	102.49	57.34	156.72	87.68	12.32
11	C	120.62	2616	39.86	33.05	3295	.01853	61.06	50.62	100.92	83.67	16.33
12	C	178.75	4067	56.49	31.60	10190	.00929	94.67	52.96	151.16	84.57	15.43
13	C	178.75	6662	55.40	30.99	5440	.01553	84.48	47.26	139.88	78.25	21.75
14	C	178.75	6329	60.26	33.71	6845	.01285	87.96	49.21	148.22	82.92	17.08
15	C	178.75	4285	62.39	34.90	6120	.01390	85.07	47.59	147.46	82.50	17.50
16	C	178.75	4049	60.29	33.73	8330	.01117	93.05	52.06	153.34	85.78	14.22
Total		2623.12		882.18				1332.78		2214.96		
Average					33.63				50.81		84.44	15.56

* Failure to eat caused the removal of this lamb.

Table 2. (concl.).

Lamb	Lot	Grams N consumed	Grams dry feces	Grams N in feces	% N in feces	Total ml. urine	Grams N per ml. urine	Grams N in urine	% N in urine	Total N in feces and urine	% N in feces and urine	% N retained by lamb
1	D	167.75	3521	46.37	27.94	2705	.02957	79.99	47.68	126.86	75.62	24.38
2	D	167.75	3248	50.53	30.12	10540	.00713	75.15	44.80	125.68	74.92	25.08
3	D	167.75	3352	49.57	29.61	12515	.00619	77.47	46.18	127.14	75.79	24.21
4	D	167.75	3493	49.86	29.72	11865	.00595	70.60	42.09	120.46	71.81	28.19
5	D	167.75	3148	44.46	26.50	5390	.01533	82.63	49.26	127.09	75.76	24.24
6	D	107.33	1992	27.76	25.86	6925	.00867	60.04	55.94	87.80	81.80	18.20
7	D	167.75	3452	44.24	26.37	20410	.00383	78.17	46.60	122.41	72.97	27.03
8	D	167.75	3352	46.80	27.90	13580	.00595	80.80	48.17	127.60	76.07	23.93
9	D	185.44	4352	58.17	31.37	6395	.01093	69.90	37.69	128.07	69.06	30.94
10	D	185.44	3477	48.73	26.28	11135	.00803	89.41	48.22	138.14	74.49	25.51
11	D	103.80	1642	20.16	19.42	2500	.02456	61.40	59.15	81.56	78.57	21.43
12	D	185.44	3965	54.09	29.17	10240	.00799	81.82	44.12	135.91	73.29	26.71
13	D	185.44	6897	52.86	28.51	3780	.01993	75.34	40.63	128.20	69.13	30.87
14	D	183.74	4446	52.86	28.77	6000	.01297	77.82	42.35	130.68	71.12	28.88
15	D	185.44	4355	55.10	29.71	6180	.01372	84.79	45.72	139.89	75.44	24.56
16	D	185.44	4018	55.21	29.77	5685	.01318	74.93	40.41	130.14	70.18	29.82
Total		2681.76		757.37				1220.26		1977.63		
Average					28.24				45.50		73.74	26.26

THE COMPARATIVE DIGESTIBILITY AND FEEDING EFFICIENCY OF PELLETED AND NONPELLETED RATIONS FOR FEEDER LAMBS

by

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AN ABSTRACT OF A THESIS

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ABSTRACT

Practical and economical methods of preparing fattening lamb rations have received a great deal of attention from experiment stations throughout the mid-west. Various ratios of roughage to concentrate have been used and the feeds processed in several ways. Pelleting the entire ration has become increasingly popular with commercial lamb feeders in the last few years and many believe that there is enough additional weight gain and labor saved to more than balance the expenses of pelleting the feeds.

This and other stations have shown an increase in rate of gain and feed efficiency in pelleting the entire ration and it has been shown that more roughage can be utilized when it is fed in the form of pellets. Lower quality roughage prepared in cube or pellet form will give comparable results to a high quality roughage fed in its natural form. This could have high economical value especially in areas where it is difficult to prepare high quality roughages.

This project was designed to determine the difference between pelleted and unpelleted rations of different concentrations and to find the digestibility and nitrogen balance of rations corresponding to those fed in the feeding trials.

Seventy-six black faced feeder lambs were used in this study. Sixteen of the top lambs by weight were used for metabolism studies and the remainder were separated into eight lots, four lots having ten lambs each and four lots with five lambs each. Two rations were used, with each ration comparing pelleted and unpelleted preparations. The first ration, sixty-five percent alfalfa hay and thirty-five percent corn, was used in four lots with the following variations: (1) in lot one the ration was pelleted and hand-fed twice

daily, (2) lot three was given chopped alfalfa hay and cracked corn twice daily, (3) lot five was the same as lot one, individually self-fed and (4) lot seven was the same as lot three, individually self-fed. The second ration, fifty-five percent alfalfa hay and forty-five percent corn, was varied in the same manner and fed in lots two, four, six, and eight respectively.

The only variation between the ingredients of the pelleted and unpelleted feeds was the hay, which was dehydrated before it was pelleted, and in the unpelleted form it was sun-cured, baled, and chopped before using in this test.

The first ration (65-35) in the pelleted form was the most efficient and gave better rates of gain than in similar but unpelleted rations. With the second ration (55-45) the unpelleted preparation was the most satisfactory in rate of gain and feed efficiency. These differences were statistically significant. The final cost per hundred pounds of gain was increased in the pelleted rations due to the extra cost of preparation.

In the digestion study there was a significant increase in the protein, nitrogen free extract, and ether extract digestion coefficients (pelleted ration) but the fiber digestion coefficients were significantly lower.

The ration with fifty-five percent hay and forty-five percent corn was more completely utilized than the higher roughage ration. The digestion coefficients of all nutrients tested (55-45 ration) were significantly higher with the exception of fiber.

There was no statistical difference in the total digestible nutrients value between pelleted and unpelleted feeds, but the higher concentrate ration was significantly higher when comparing the two concentrations.

In the nitrogen balance studies, lambs receiving the pelleted rations had a highly significant increase in the amount of nitrogen retained above that retained by lambs receiving the unpelleted rations, and in the pelleted rations the fifty-five forty-five ratio was significantly higher. In the unpelleted rations there was no difference between the two concentrations.

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